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Exemple : Soit f la fonction définie par:

$$f(x) = \begin{cases} \cos x & \text{si } 0 \leqslant x \leqslant \frac{\pi}{4} \\ \sin x & \text{si } \frac{\pi}{4} \leqslant x \leqslant \frac{\pi}{2} \end{cases}$$

Calculer $\int_0^{\pi/2} f(x)\,dx$.

Rep :

$$\int_0^{\frac{\pi}{2}} f(x)\,dx = \int_0^{\frac{\pi}{4}} \cos x\,dx + \int_{\frac{\pi}{4}}^{\frac{\pi}{2}} \sin x\,dx$$

$$= [\sin x]_0^{\frac{\pi}{4}} + [-\cos x]_{\frac{\pi}{4}}^{\frac{\pi}{2}}$$

$$= \sin\left(\frac{\pi}{4}\right) - \sin(0) - \cos\left(\frac{\pi}{2}\right) + \cos\frac{\pi}{4}$$

$$= \frac{\sqrt{2}}{2} - 0 - 0 + \frac{\sqrt{2}}{2}$$

$$= \boxed{\sqrt{2}}.$$

Exemple : Calculer $I = \int_0^{\pi} (2\sin t + \cos t + 3)\,dt$

Rep :

$$\int_0^{\pi} (2\sin t + \cos t + 3)\,dt = 2\int_0^{\pi} \sin t\,dt + \int_0^{\pi} \cos t\,dt + \int_0^{\pi} 3\,dt$$

$$= 2[-\cos t]_0^{\pi} + [\sin t]_0^{\pi} + 3[t]_0^{\pi}$$

$$= \boxed{3+\pi}$$

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